

**Quality Assurance Project Plan
Title and Approval Sheet
Draft, April 2002
Kinnickinnic River Sediment Sampling in FY2002:**

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1. SUMMARY

1.1 Purpose

The sampling efforts detailed in this document outlines a plan to determine the extent of contamination in a stretch of the Kinnickinnic River, Milwaukee Wisconsin. The data collected during this study will be used to determine alternatives to perform environmental clean-up of the contaminated sediments. Proposed testing for this sampling include: PCBs, PAHs, TOC, and Toxicity Characterization. Samples for particle size distribution, hydrometer, loss upon ignition, and Atterberg limits will be collected but not analyzed within the scope of this project.

Primary Objective: Collect sufficient data to ascertain the current state of contamination in a stretch of the Kinnickinnic River.

Secondary Objective: Collect samples for geotechnical analysis to generate sufficient data to create plans and specifications for dredging the contaminated sediments.

1.2 Background

Site Location

The Kinnickinnic flows primarily east through the southeast corner of Wisconsin, discharging into Lake Michigan after a convergence with the Milwaukee River in Milwaukee, Wisconsin. The stretch of the Kinnickinnic River subject to this sediment sampling investigation begins at the State Highway 32 bridge and extends approximately 1,700 ft. upstream to the Becher Street bridge.

Historical Sampling

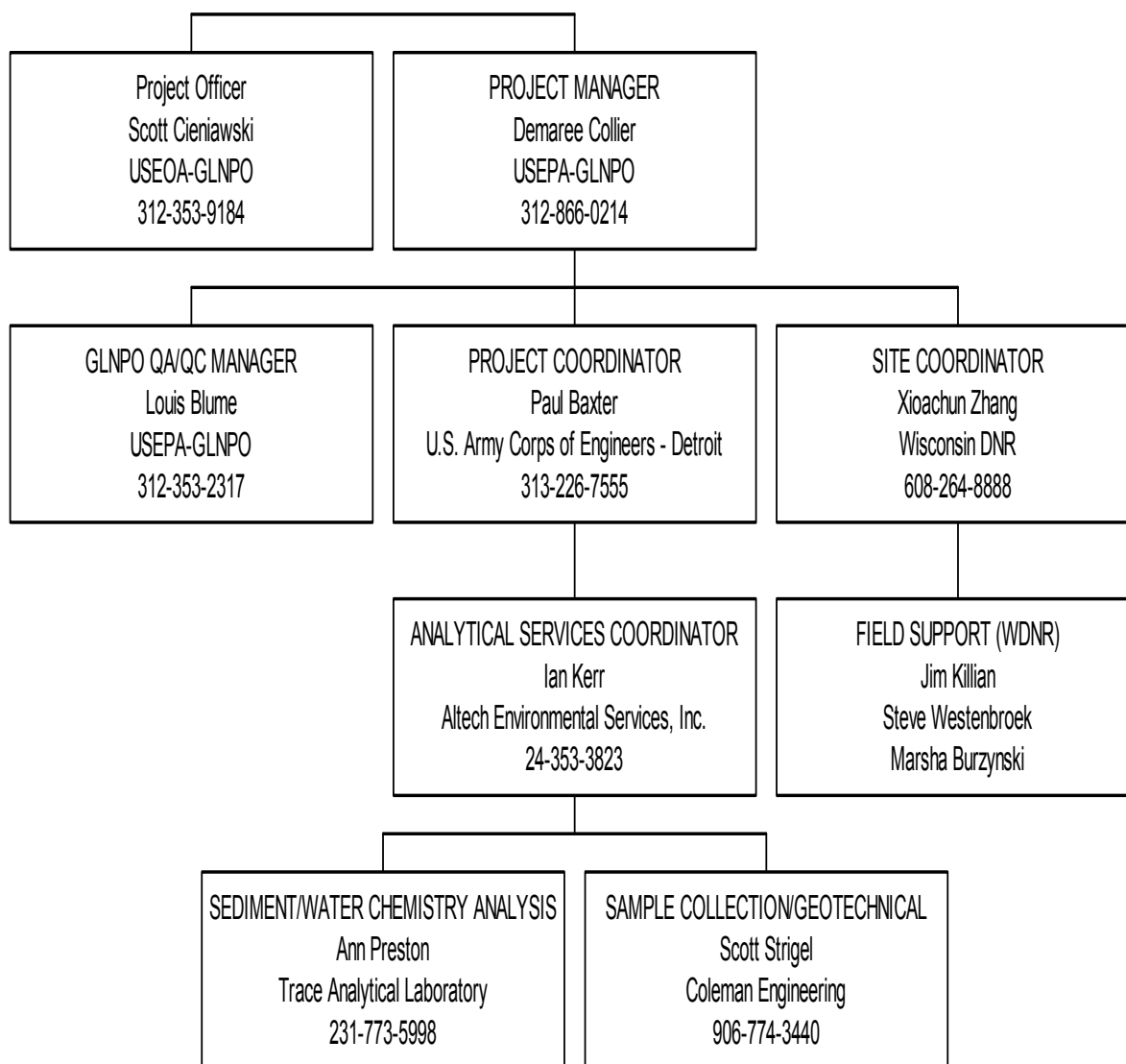
A limited amount of sediment chemistry data is available to document contamination conditions at the site. If available, the following historical data sets will be evaluated as part of this project:

1. Wisconsin DNR sediment testing;
2. University of Wisconsin, Milwaukee sediment testing;
3. 2001 Tetra Tech Em, Inc (EPA Superfund Sampling).

The above sediment sampling and analytical projects revealed sediments within this project area to have sufficient contamination at least to the depth of 7 feet to warrant further investigation. This project is designed to delineate the full extent of contamination within the project area.

1.3 Project Organization

Figure 1 provides a summary of the project organization for this project. A description of the duties of each individual is provided below.

Figure 1. Organizational Chart**USEPA-GLNPO**

USEPA-GLNPO is the principal investigating agency for this sediment survey. They are responsible for coordination and approval of the Scope of Work and QAPP as well as the principal client for the final data. USEPA-GLNPO staff associated with this project include:

Person:

Scott Cieniawski
Project Manager
77 W. Jackson Blvd. (G-17J)
Chicago, IL 60604
Phone: 312-353-9184
Cieniawski.Scott@epamail.epa.gov

Responsibilities:

Coordinate Project Funding

Demaree Collier
Project Manager
77 W. Jackson Blvd. (G-17J)
Chicago, IL 60604
phone: 312-886-0214
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Project Management
Review/Approve QAPP
Perform Project Management Tasks

Louis Blume
GLNPO QA Manager
77 W. Jackson Blvd. (G-17J)
Chicago, IL 60604
phone: 312-353-2317
blume.louis@epa.gov

Review/Approve QAPP

U.S. Army Corps of Engineers - Detroit District

The U.S. Army Corps of Engineers will provide laboratory contracting support, and an initial QA/QC review of the project data. The USACE representative will be responsible for developing a project Scope of Work and QAPP, contracting collection of sediment samples and analysis of sediment samples, contacting USEPA-GLNPO/WDNR regarding any concerns regarding the data received from the laboratories, and advising USEPA-GLNPO/WDNR regarding any concerns expressed by the laboratory. USACE individual involved in this project is:

Person:

Paul Baxter
Project Coordinator
477 Michigan Av.
U.S. Army Corps of Engineers
Detroit, Michigan 48226
313-226-7555
Paul.R.Baxter@lre02.usace.army.mil

Responsibilities:

Prepare Scope of Work and Project QAPP
Contract Sampling and Analytical Testing
Perform Contract Management Activities
Initial QA/QC Review

Wisconsin DNR

The Wisconsin DNR (WDNR) will provide oversight/coordination and field support to this project. Field support will be provided during sediment sampling. WDNR will also provide historical data, results, and information on sampling and analysis methods used during historical studies. WDNR will be responsible for evaluation of analytical test results which will be submitted to EPA-GLNPO Project Manager. The WDNR staff involved in this project are:

Person:

Xiaochun Zhang
Project Investigator - WDNR
Wisconsin DNR
101 Webster St., Box 7921
Madison, Wisconsin 53707-7921
608-264-8888
ZhangX@mail01.dnr.state.wi.us

Responsibilities:

Oversee/Coordinate Project Sampling Activities
Provide Information on Historical Sampling Results
and Analytical Methods
Review/Approve QAPP
Analyze Data and Prepare Report

Steve Westenbroek
 Water Resources Engineer
 Wisconsin DNR
 2300 N. Dr. Martin Luther King Jr. Dr.
 Milwaukee, Wisconsin 53212
 414-263-8576
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Provide Field and Technical Support

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Provide Field and Technical Support

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 Water Resources Planner
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 Wisconsin DNR
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 414-263-8708

Provide Field and Technical Support

Laboratory

Laboratory analyses for this project will be performed by Trace Analytical Laboratories, Inc. Altech Environmental Services, Inc. (Altech) will coordinate analytical services from the laboratory under a contract agreement with the USACE. Altech will be responsible for sub-contracting for sample analysis. Trace Analytical Laboratories, Inc. will have sample analysis and review responsibilities on this project. The laboratory will have their own provisions for conducting an internal QA/QC review of the data before it is released to the U.S. Army Corps of Engineers. The laboratory contract supervisor listed below will contact the USACE project coordinator with any data concerns.

Written QA/QC reports will be filed by the analytical laboratory when data is submitted to the USACE. Corrective actions will be reported to the USACE project coordinator along with the QA/QC report (see Section 9). The laboratory may be contacted directly by USEPA or USACE personnel to discuss QA concerns. Altech will act as laboratory coordinator on this project and all correspondence from the laboratory should be coordinated with Altech. Responsibilities of the laboratory and the laboratory coordinator are provided below:

Person:

Ian Kerr
 Project Manager
 Altech Environmental Services, Inc.
 313-535-7882
 ikerr@altechenvironmental.com

Responsibilities:

Review/Approve QAPP
 Review final analytical report
 Ensure Sub-Contract Laboratory Resources are
 Available on an As-required Basis
 Review Final Analytical Report

Ann Preston
Client Services Manager
Trace Analytical Laboratories, Inc.
2241 Black Creek Rd.
Muskegon, Michigan 49444-2673
231-773-5998
traceanalytical@mad.scientist.com

Coordinate Chemical Analyses
Ensure Laboratory Resources are
Available on an As-required Basis
Supply Required Sample Bottles
and Coolers (including temperature blanks)

Gregory J. Hayes
QA/QC Manager
Trace Analytical Laboratories, Inc.
2241 Black Creek Rd.
Muskegon, Michigan 49444-2673
traceanalytical@mad.scientist.com

Review/Approve QAPP
Perform QA/QC Review on Analytical Test Results
Prepare a QA/QC Case Narrative

Sample Collection

Sample collection will be accomplished utilizing the services of Coleman Engineering Company (Coleman). Coleman will perform sample collection under the direction of the on-site field coordinator. Coleman will be responsible for preparing sample boring logs and supplying all equipment necessary for sample collection and containers for geotechnical testing of the sediments. Coleman's on-site project manager is:

Scott Strigel
Project Manager
Coleman Engineering Company
635 Industrial Park Dr.
Iron Mountain, Michigan 49801
906-774-3440
colemanengineering@uplogon.com

Review/Approve QAPP
Coordinate and Perform Sample Collection

2. Project Description

2.1 Data Uses and Expected Measurements

GLNPO proposes an assessment of contamination. Work would be coordinated with the Wisconsin DNR to insure mapping the extent of contamination will be thorough. The proposed work components are summarized below.

Determination of Existing Data Availability

The first step of this project will be to identify sources and availability of data for this site. The Wisconsin DNR, University of Wisconsin, Milwaukee, U.S. EPA have collected data at or near the project site.

GLNPO will coordinate with Wisconsin DNR to determine the quality and availability of existing data.

Sediment Chemistry Sampling

Sediment chemistry sampling will consist of the collection of a sediment core samples at approximately 16 locations. Two (2) of the locations will be upstream of the project area and 14

of the locations will be within the project area. All sediment cores will be sectioned into sub-samples of 0'-2', 2'-4', 4'-6', 6'-8', 8'-10', 10'-12', 12'-14', 14'-16', 16'-18', and 18'-19'. At four locations cores will extend an additional 7 ft for geotechnical testing. It is anticipated there will be a minimum of 5 and a maximum of 10 samples per boring for chemical testing. The two locations upstream of the project area will be surficial grab (ponar) samples. All sediment samples collected will be analyzed for PCBs Aroclors and PAHs. Seven of the borings (borings ending with an odd number) will also have vertical composites for toxicity characterization testing as defined in 40 CFR Ch 1 Part 261 as well as TOC analysis on the boring discrete samples. Refer to Figure 5 for illustrations of sediment borings. Table 1 summarizes the anticipated water and boring depths and number of samples.

Table 1. Kinnickinnic River Approximate Station Boring Depths

Station I.D.	Water Depth (Ft.)	Boring Depth (Ft.)	No. Environmental Samples	No. Geotechnical Samples
KK0201	3	16	8	4
KK0202	5	14	7	3
KK0203	0 ¹	19	10 ¹	4
KK0204	7	12	6	3
KK0205	0 ¹	19 ¹	10 ¹	4
KK0206	0 ¹	19 ¹	10 ¹	4
KK0207	9	10	5	2
KK0208	0 ¹	19	10 ¹	4
KK0209	3	16	8	4
KK0210	6	13	7	3
KK0211	3	16	8	4
KK0212	6	13	7	3
KK0213	8	11	6	3
KK0214	7	12	6	3
KK02US1	N/A	N/A	1	1
KK02US2	N/A	N/A	1	1
Totals			100¹⁻²	50¹

1 - Estimated

2- Does not include field QA/QC samples

2.2 Criteria and Objectives

2.2.1 Sediment Chemistry

Tables 2 through Table 7 provide the requirements necessary for sediment chemistry testing. Standard Operating Procedures for analysis of sediments for this project are available upon request to the USACE Project Coordinator, Paul Baxter.

Table 2. Kinnickinnic River Sediment Testing Requirements

Parameter	No. of Samples	TDL¹	Precision (RPD)	Analytical Method
Bulk Sediment PCBs	122	Per Method	50 %	SW-846/8082
Bulk Sediment PAHs	122	Per Method	50 %	SW-846/8270C
Bulk Sediment TOC	61	1,000 mg/kg	20 %	Walkely-Black
TCLP Procedure	7	N/A	N/A	SW-846/1311
TCLP Procedure for Volatiles	7	N/A	N/A	SW846/1311
TCLP Metals	7	Table 3	Table 3	SW-846 (Table 3)
TCLP Volatiles	7	Table 4	Table 4	SW-846/8260B
TCLP Semivolatiles	7	Table 5	Table 5	SW-846/8270C
TCLP Pesticides	7	Table 6	Table 6	SW-846/8081
TCLP Herbicides	7	Table 7	Table 7	SW-846/8150
Corrosivity	7	N/A	20 %	SW-846/9040/9045B
Reactive Cyanide	7	0.5 mg/kg	7.5 %	SW-846 Ch. 7/EPA 9012
Reactive Sulfide	7	5.0	20 %	SW-846/Ch-7/EPA 376.2
Ignitability	7	> 200 ⁰ F	20 %	SW-846/1020A
Paint Filter Test	7	N/A	N/A	EPA 9095

1 – Target Detection Limit

Table 3. Kinnickinnic River TCLP Metals Requirements

Analyte	Analytical Method	TDL¹ (mg/l)	Precision (RPD)
Arsenic	SW-846 6010/6020/7000	0.30	20 %
Barium	SW-846 6010/6020	1.00	20 %
Cadmium	SW-846 6010B/6020/7000A	0.10	20 %
Chromium	SW-846 6010B/6020	0.50	20 %
Lead	SW-846 6010B/6020/7000A	0.50	20 %
Mercury	SW-846 7471A	0.01	12 %
Selenium	SW-846 6010B/6020	0.60	20 %
Silver	SW-846 7761/6010B/6020	0.10	20 %

1 – Target Detection Limit

Table 4. Kinnickinnic River TCLP Volatiles Requirements

Analyte	TDL¹ (mg/l)	Precision
Benzene	0.05	50 % RPD
Carbon Tetrachloride	0.05	50 % RPD
Chlorobenzene	0.05	50 % RPD
Chloroform	0.05	50 % RPD
Methyl ethyl keytone	0.25	50 % RPD
1,4-Dichlorobenzene	0.05	50 % RPD
1,2-Dichloroethane	0.05	50 % RPD
1,1-Dichloroethylene	0.05	50 % RPD
Trichloroethene	0.05	50 % RPD
Tetrachloroethylene	0.05	50% RPD
Vinyl chloride	0.05	50 % RPD

1- Target Detection Limits

Table 5. Kinnickinnic River TCLP Semivolatiles Requirements

Analyte	TDL¹ (mg/l)	Precision (RPD)
2-Methylphenol	0.10	50 %
3/4-Methylphenol	0.10	50 %
Methylphenol(2,3,4)	0.10	50 %
2,4-Dinitrotoulene	0.10	50 %
Pentachlorophenol	0.10	50 %
Hexachlorobenzene	0.10	50 %
Hexachlorobutadiene	0.10	50 %
Hexachloroethane	0.10	50 %
Nitrobenzene	0.10	50 %
Pyridine	0.10	50 %
2,4,5-Trichlorophenol	0.10	50 %
2,4,6-Trichlorophenol	0.10	50 %

Table 6. Kinnickinnic River TCLP Pesticides Requirements

Analyte	TDL¹ (mg/l)	Precision (RPD)
Chlordane	0.020	50 %
Endrin	0.010	50 %
Heptachlor	0.008	50 %
Heptachlor Epoxide	0.008	50 %
4,4-DD	0.010	50 %
Lindane	0.010	50 %
Methoxychlor	0.500	50 %
Toxaphene	0.500	50 %

Table 7. Kinnickinnic River TCLP Herbicides Requirements

Analyte	TDL¹ (mg/l)	Precision (RPD)
2,4-D	10.0	50 %
2,4,5-TP (Silvex)	1.0	50 %

2.3 Special Personnel, Training, and Equipment Requirements

Sediment Sampling

Sediment sampling will require the use of the Coleman Engineering's barge and associated drilling rig or an equivalent. Equipment requirements for collecting sediment core samples are contained in Appendix A.

Under normal operations, the minimum Personal Protective Equipment (PPE) required to be worn by personnel working on deck aboard the drill rig barge is Modified Level D Protection. Modified Level D Protection includes: hard hat with face shield, steel toed footwear, tyvek coveralls, boot covers, Personal Floatation Device, and double gloves. Modified Level D indicates that no respiratory protection is required.

This survey will require PPE suitable for normal operating conditions as described above. The main method to avoid exposure to the contaminants present, is to avoid direct contact with skin. Washing hand immediately after sampling will also reduce potential exposures to the contaminants.

2.4 Project Schedule

A tentative project schedule is provided in Table 8. All personnel shown in Figure 1 should be contacted regarding significant schedule changes.

Table 8. Tentative Project Schedule

Task	Completion Date
Scope of Work Acceptance	May 2002
QAPP Development and Approval	May 2002
Sediment Sampling	June 2002
Completion of Sediment Analysis	July 2002
Draft Analytical Report Due to USACE	July 2002
Final Analytical Report Due to USACE	August 2002
Report Due to GLNPO and WDNR	September 2002
QA/QC Review Due to GLNPO and WDNR	November 2002

3. Sampling Plan

3.1 Sampling Network Design and Rationale

The purpose of this sampling survey is to determine the quality of the sediments in the project area. In order to obtain a full picture of the extent of contamination a large number of samples need to be collected. Sediment chemistry and geotechnical test samples will be collected. These samples will allow WDNR and the COE to determine the levels of contaminants present in the sediments and development of disposal options of the dredged sediments.

Figure 2 presents an overview of the project area and approximate locations for collection of sediment samples. Latitude/longitude of the sampling points within the project area are provided in Appendix E. Exact sample locations may be relocated by the on-site field coordinator during

sampling. This will be dependent upon, but not limited to; site characteristics and ability of the sampling team to collect sufficient sample material.

The sampling locations are designed to provide focused coverage of the project area as well as some general coverage upstream of the project area. Table 9 summarizes the types of data and analyses to be collected at each type of sampling location.

Table 9. Summary of Data and Analyses at Sampling Locations

Core Sample (14 locations)	Grab Samples (2 Locations)
Sediment Chemistry	Sediment Chemistry
Sediment Depth	Water Depth (Actual & Corrected)
Water Depth (Actual & Corrected)	Physical Descriptions of Samples
Geotechnical Sample Collection	Photographs of Samples
Physical Descriptions of Samples	
Photographs of Samples	

3.2 Definition of Sample Types

Three types of sediment samples will be collected during this survey; Routine Field Samples (RFS), Field Replicates (FR), and Field Duplicates (FD). Each sample type is described below.

Routine Field Samples (RFS): Prepared by collecting a section of a sediment core, homogenizing the sediments collected, and filling all required sample jars. Routine field samples will be collected at fourteen (14) locations. Refer to Figure 3 for locations of the RFS.

Field Duplicates (FD): Prepared by filling a second set of sample jars from a sediment core after the cores have been homogenized. FDs will be collected at one (1) sediment core location. This is approximately equivalent to a ratio of FDs to RFSs of 1 to 10 (10%). Location of the FDs will be determined in the field by the on-site sample collection coordinator.

Field Replicates (FR): Prepared by collecting a second, sediment core sample, homogenizing the material separately from the RFS and filling the required sample bottles. FRs will be collected at one (1) sediment core location. This is approximately equivalent to a ratio of FRs to RFSs of 1 to 10 (10%). Locations of the FRs will be determined in the field by the on-site sample collection coordinator.

3.3 Type and Number of Samples

Table 10 summarizes the type and number of samples to be collected during this sampling event. The estimated number of samples does include all RFS, FD, and FR samples.

Table 10. Summary of Type and Number of Samples to be Collected

Sample Type	Estimated Number of Samples ¹	Sample Matrix	Analysis Required
Sediment Chemistry	122	Sediment	PCBs Aroclors and PAHs
Sediment Chemistry	61	Sediment	TOC
Sediment Chemistry	7	Sediment	Toxicity Characterization
Geotechnical Samples ²	50	Sediment	Grain Size with Hydrometer and Loss Upon Ignition
Geotechnical Samples ²	8	Sediment	Atterberg Limits

¹ - Includes field QA/QC samples.

² - To be analyzed at a later date, analysis is not included within this project.

All of the data listed in Table 10 is considered critical to the success of this assessment project.

3.4 Field Data Collection

Three sets of field data will be collected that are critical to the data quality objectives for this project.

Latitude/Longitude Location: This data is critical for use in determining where sediment samples were collected. The Differential Global Positioning Systems (DGPS) onboard the Coleman Engineering barge will be capable of ascertaining horizontal locations with < 5 meters of accuracy. To achieve this accuracy, it is important that the DGPS is in good working order and are obtaining strong satellite signals. The field team will be responsible for checking the satellite signal strength for the DGPS system prior to recording this data and for ensuring that the system is recording equivalent horizontal locations. Any problems with signal strength shall be recorded on in the field boring log. If problems are noted, the field team should provide a qualitative description of the sampling location utilizing any available, permanent landmarks. The DGPS unit will have the accuracy checked prior to each days sampling activities by locating one of the USACE survey markers shown on Figure 3. The DGPS unit's antennas will be located as close to the marker as possible and the reading will be compared to those on Figure 3.

Sediment Depth: Sediment depth data is critical for determining the volume of sediments with a potential for being contaminated. Sediment depth will be measured to the nearest 0.1 ft.

Water Depths: Water depths will be taken directly over the location of the sampling site prior to sample collection with a weighted measuring tape. Water depths will be reported as actual depth measured and as water depth corrected to Low Water Datum. Low Water Datum is available for Milwaukee Harbor at the closest daily and hourly water levels

station for Lake Michigan, which can be obtained from the Internet at the NOAA home page for water elevations. Water depths will be measured to the nearest 0.1 ft.

[Note: Low Water Datum is available in 6 minutes intervals. The address is: http://www.opsd.nos.noaa.gov/data_res.html. From this address under Preliminary Water Level Data select Great Lakes Stations then choose Milwaukee and display recorded water levels in feet.]

4. Sample Collection and Handling

4.1 Sample Collection

4.1.1 Sediment Cores

Sediment cores will be collected utilizing a two inch and/or three inch diameter (depending on amount of recovery) split spoon sampler and associated hollow stem auger (ASTM Method D-1586-84, Standard Method for Penetration Test and Split-Barrel Sampling of Soils). The split spoon sampler is capable of collecting continuous sediment cores to the depths required for this project. All sediment cores will be analyzed for sediment chemistry as summarized in Table 10 and explained in detail in Section 5.

Once the barge has been positioned over a given sampling station, the following activities will take place, but not necessarily in this order:

1. Water depth will be measured through the hole in the barge where the samples will be collected;
2. Location coordinates will be recorded by placing the GPS antenna over the sampling hole;
3. The split spoon sampler will be lowered penetrating two feet into the sediment, if applicable, the sampler will be hammered into the sediment with a 30 inch free fall of a 140 lb. hammer and the blow counts per every six inches will be recorded in the boring log. The split spoon sampler will be retrieved to the barge deck for sample handling. The hollow stem auger will be lowered to the sediment surface. If upon retrieval, the split spoon sampler did not retain/collect any sample, the hollow stem auger will be slowly rotated to a depth of two feet and slowly retrieved to the surface of the barge. A sediment sample will be collected from the hollow stem auger fins representative of the two foot sample depth.
4. After the 0 to 2 ft. depth has been sampled, the hollow stem auger will be advanced to the 2 foot depth and flushed with site water to remove any residual sediments within the auger.
5. The split spoon sampler will then be advanced to the 4 ft. depth and retrieved for sample handling;
6. This procedure will continue until either native material (such as clay) is encountered or the predetermined depth for a given boring is achieved.

4.1.2. Sediment Grab Samples

Sediment grab samples will be collected utilizing a ponar dredge sampler.

4.1.3. Hand Augured Samples

Four of the sampling locations within the project area are not accessible to the drill rig barge. Therefore, samples will be collected from these locations utilizing a bucket hand auger. Samples will be collected to the deepest depth as practical depending upon but not limited to hole collapse, complete resistance, obtaining the project sample depth of 19 ft., etc.

4.2 Sample Handling

4.2.1 Sample Processing

Samples not analyzed for TCLP Toxicity Characterization.

Upon retrieval of the split spoon/ponar sampler, the sampler will be carefully opened, sample retained within the split spoon sampler will be measured for recovery, transferred to a clean stainless steel mixing bowl or equivalent, photographed, a description will be recorded, thoroughly homogenized, and transferred into the appropriate sample containers. Samples for chemical analysis will be placed on ice within a cooler for shipment to the laboratory. Samples for geotechnical testing will be placed into an appropriate sample container ensuring that there will be no loss of moisture from the samples and then stored in a storage container for transport to Coleman Engineering Company's testing facility.

Samples analyzed for TCLP Toxicity Characterization.

Upon retrieval of the sediment sample, the sample will be transferred to a clean stainless steel mixing bowl or equivalent, photographed, and a description will be recorded. For TCLP volatiles, an aliquot will be transferred into the appropriate laboratory supplied sample container (TCLP volatiles samples will be composited at the laboratory). Another aliquot will be transferred to the sample container for TOC analysis. The remainder of the material will be thoroughly homogenized and a sufficient aliquot will be transferred into a second stainless steel mixing bowl for compositing. This process will be repeated for each 2 ft. split spoon sample collected from the boring. Upon completion of the boring, the sediment placed into the second stainless steel mixing bowl will be photographed and thoroughly homogenized and transferred into the proper TCLP extractable sample container.

4.2.2 Equipment Decontamination

Immediately after the samples have been transferred from the split spoon/ponar sampler, the equipment will be scrubbed with on-site water, scrubbed with aalconox/liquinox solution, and followed by a on-site water rinse. The on-site water wash and rinse may be disposed of on-site. Thealconox/liquinox wash solution will be retained by the sampling team and disposed of properly at the completion of this sampling project. Disposal should be to a wastewater treatment facility.

4.2.3 Sample Containers

After processing, sediment samples will be placed into the appropriate sample containers as summarized in Table 6. A field sample log shall be filled out for each sampling location.

*Note: The analyzing laboratory will supply all required Chain-of Custody forms, sample containers, and sample coolers, including a temperature blank with each sample cooler. **The coolers and sample bottles shall be shipped to the following address no later than June 14, 2002:***

*Scott Strigel
Coleman Engineering Company
635 Industrial park Dr.
Iron Mountain, Michigan 49801*

Table 11. Sample Container and Preservation Requirements

Analyses	Container	Preservation Technique	Holding Times
PCBs	8 oz Glass	Cool/dark, $\leq 4^{\circ}\text{C}$	14 days/40 days ²
PAHs		Cool/dark, $\leq 4^{\circ}\text{C}$	14 days/40 days ²
TOC	4 oz Glass	Cool/dark, $\leq 4^{\circ}\text{C}$	28 days
TCLP Volatiles	4 oz Glass	Cool/dark, $\leq 4^{\circ}\text{C}$	14 days/40 days ²
TCLP Extractables ¹	16 oz Glass	Cool/dark, $\leq 4^{\circ}\text{C}$	14 days/40 days ²
Ignitability, Corrosivity, and Reactivity		Cool/dark, $\leq 4^{\circ}\text{C}$	Analyze as soon as practical
Grain Size	16 oz., Widemouth Plastic	Cool/dark, $\leq 4^{\circ}\text{C}$, No head space ³	No hold time
Hydrometer	Included in grain size	Cool/dark, $\leq 4^{\circ}\text{C}$	No hold time
Atterberg Limits	Included in grain size	Cool/dark, $\leq 4^{\circ}\text{C}$	No hold time
Loss upon ignition	Included in grain size	Cool/dark, $\leq 4^{\circ}\text{C}$	No hold time
Percent Moisture	Included in PCBs	Cool/dark, $\leq 4^{\circ}\text{C}$	28 days

¹ As, Ba, Cd, Cr, Cu, Pb, Hg, Ag, Semivolatiles, Pesticides, and Herbicides

² From time of collection to extraction/From time of extraction to analysis

4.2.4 Sample Labeling

Each sample bottle shall be individually labeled using a waterproof pen. The label shall contain, but not be limited to, the following information:

- Unique Sample Number: KK02XX-XX/XX; where “KK02” refers to the Kinnickinnic River 2002 sampling event, “XX-XX/XX” refers to the numerical sequence of the sample locations and the depth interval of the sample (KK0201-00/02 is sample number 1 collected from the sediment depth of 0 to 2 feet). Field duplicates and field replicates shall have a suffix of "R" for replicate and "D" for duplicate.
- Sample Date (MM-DD-YYYY)
- Sample Time (HHMM, on a 24-hour clock)
- Analysis to be performed (e.g. PCBs, PAHs, etc.)
- Sampler's Initials
- Client: Altech Environmental Services
- Project: Kinnickinnic River

An example label is shown in Figure 4. Clear tape will be placed over the label after the label has been completely filled out and attached to the sample container. The sample identification number and date of sample collection will be written on the sample container closure with a water proof marker.

Figure 4. Example Sample Label

Project: Kinnickinnic River	
Client: Altech Environ. Services	
K0201-00/04	6-18-2002
PCBs & PAHs	1300 hrs.
	DC

4.2.5 Shipment and Chain-of-Custody

After collection and labeling, all glass containers shall be placed in a zip-lock bag, wrapped in bubble wrap and placed in an appropriate sample cooler. Within 24 hours of sample collection, the samples will be sent to the analyzing laboratory. After samples are collected each day, the Field Team Coordinator shall be responsible for shipping and/or arranging pickup of samples. A Shipping Container Checklist is provided for guidance (Appendix D). The Field Team Coordinator shall insure that:

1. The coolers contain sufficient ice to keep the sample below 4° C during the shipment process and samples are immobilized with bubble pack to reduce the risk of breakage,
2. The chain of custody form (see example in Appendix A) is properly filled out,
3. A copy of the chain-of-custody form shall be retained and provided to the project manager,
4. A copy of the chain-of-custody form will be placed in a "ziploc" bag and taped to the inside lid of the cooler,
5. A temperature blank is included in each sample cooler (temperature blank to be supplied by the laboratories),
6. The outside of the container will be sealed using fiberglass or duct tape,
7. The laboratory name, phone number, and address, as well as the return name and address, will be clearly labeled on the outside of the cooler,
8. The samples will be sent to the contract laboratory by an overnight courier, and
9. Receipts of bills of lading will be retained as part of the permanent documentation and a copy of the air bill and/or bill of lading will be sent to Altech Environmental Services Project Manager, Ian Kerr,.
10. Commercial couriers are not required to sign off on the sample tracking form,
11. Laboratories are contacted prior to shipment to insure they are prepared for sample arrival.

Note: The analyzing laboratory will supply chain-of custody forms to the Project Field Sample Collection Team Leader, Scott Strigel, prior to the sampling event.

Table 11 summarizes where each of the respective types of samples shall be shipped.

Table 12. Addresses for Shipment of Samples

Analysis	Laboratory Contact Information
PCBs, PAHs, TOC, and Toxicity Characterization	Ann Preston Trace Analytical Laboratories, Inc. 2241 Black Creek Rd. Muskegon, Michigan 49444-2673 (231) 773-5998 Ext. 224
Grain Size with Hydrometer, Atterberg limits, and Loss Upon Ignition ¹	Coleman Engineering - Scott Strigel 635 Industrial Park Rd. Iron Mountain, Michigan 49801 (906) 774-3440

¹ - Geotechnical samples may be held on-site and in custody by Coleman Engineering Company and taken to Coleman Engineering's facility with the sampling team after completion of the project.

4.2.6 Receipt of Samples

Upon receipt of project samples for chemical analysis the laboratory shall

- Complete their portion of the chain-of-custody forms,
- Contact the Altech Environmental Services Project Manager to inform him of sample receipt and to discuss any problems or issues,
- Insure that the samples are maintained at < 4°C,
- Complete a Cooler Receipt Form (See example in Appendix C).
- If there are any sample shipment problems, the laboratory should contact Altech Environmental Services Project Manager (Ian Kerr) and the Altech Environmental Services Project Manager shall contact the USACE Project Coordinator (Paul Baxter) and the USEPA Project Manager (Demaree Collier) as soon as the sample shipment problem is discovered,
- Fax a copy of the chain-of-custody form to the Altech Environmental Services Project Manager, Ian Kerr at (248) 353-5485

5. Laboratory Analysis

5.1 Analytical Methods

Analysis and preparation methods for all required analyses are provided in Table 2.

5.2 Data Quality Objectives (DQOs)

Data from the historical sampling events contains very little information regarding the extent of contamination within the project area. Additionally, the analytical obtained in the historical sampling events is not sufficient to meet the primary and secondary objectives of this project.

Therefore, the DQOs chosen for this project will be based on the objectives required to adequately assess the current state of contamination within the project area.

The DQOs for the laboratory analysis portion of this project are defined according to the following four quality assurance objectives.

Definitions

Instrument Detection Limit (IDL): The instrument detection limit (IDL) is the lowest analyte concentration that an instrument can detect. The IDL is determined on samples that have not gone through any sample preparation (e.g. calibration standards).

Limits of Quantification (LOQ): The limits of quantification is the lowest analyte concentration that can be accurately measured and reported, as opposed to simply detected.

Method Detection Limit (MDL): Method detection limits (MDL) will be determined by making repeated measurements (a minimum of seven) over several non-consecutive days of either a calibration blank or a low-level standard with a concentration within 1-5 times the IDL. The MDL is calculated, at the 95 percent confidence level, as 3 times the standard deviation of the measured sample concentrations.

Target Detection Limit (TDL): The target detection limit (TDL) is the concentration at which each analyte must be detected and quantified in order to meet the study objectives. This means that, if possible, all IDLs, MDLs and LOQs, should be less than the TDLs for all analytes. If the laboratory expects any of the IDLs, MDLs, or LOQs to exceed the required TDLs, they must contact the USACE and USEPA project managers to develop corrective action procedures.

5.2.1 Method Detection Limits and Level of Quantification

For quantitative chemical analyses, the analytical laboratory will be required to determine the instrument detection limit (IDL) prior to any analysis of the routine samples. The target detection limit (TDL) is the concentration at which the presence of an analyte must be detected to properly be able to assess and satisfy the DQOs. To be acceptable, a laboratory must demonstrate that the MDL is less than or equal to the TDL through use of laboratory quantitation standards. The laboratory shall also strive to set the dry sample Levels of Quantification (LOQs) below the applicable TDLs. Tables 2 through 7 contain the threshold effect concentrations (TECs) for the chemicals to be analyzed that have actually had the TECs calculated and contain the exact information, plus a few additional parameters that do not have calculated TECs, which are all also listed at the TDL for each parameter.

Target detection limits for all required sediment chemistry are provided in Tables 2 through Table 7.

Note: If a laboratory is unable to obtain MDLs and LOQs that are below the respective TDLs for each analyte, the laboratory shall contact the U.S. Army Corps of Engineers Project Coordinator and/or the U.S. Environmental Protection Agency's Project Manager to discuss required course of action. Decisions to be made could include: implementation of additional sample clean-up procedures prior to analysis, USEPA acceptance of higher MDLs and LOQs, or implementation of other potential suggestions.

Note: It is understood that potential high moisture contents of the sediments could impact MDLs and LOQs achieved by the laboratory. In an effort to reduce the impact of high water content on MDLs and LOQs the labs shall decant free water from the surface of the sediment samples prior to analysis.

5.2.2 Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias assessments for environmental measurements are made using personnel, equipment, and spiking materials or reference materials as independent as possible from those used in the calibration of the measurement system. When possible, bias assessments should be based on analysis of spiked samples rather than reference materials so that the effect of the matrix on recovery is incorporated into the assessment. A documented spiking protocol and consistency in following that protocol are important to obtaining meaningful data quality estimates. Spikes should be added at concentrations approximately at the mid-range. Spiked samples shall be used in accordance with the specified method.

Bias will be assessed through the use of certified reference materials (CRMs), standard reference materials (SRMs: a reference material certified by the U.S. National Institute of Standards Technology [U.S. NIST]), or other standards, such as, matrix spikes. The use of spiked surrogate compounds for GC and GC/MS procedures for PCB and PAH compounds, respectively, will be used to assess for bias.

Matrix spike and matrix spike duplicate samples (MS/MSD) also will be used to assess bias as prescribed in the specified methods. Acceptable recovery values will be within the recoveries specified by each of the analysis methods. Control samples for assessing bias will be analyzed at a rate as specified in the analytical SOPs and specified analytical methods.

5.2.3 Precision

Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as either the range \mathbb{R} or as the standard deviation (s). It may also be expressed as a percentage of the mean of the measurements, such as relative percent difference (RPD) or relative standard deviation (RSD) (for three or more replicates).

Laboratory precision is assessed through the collection and measurement of laboratory duplicates. The laboratories shall follow the protocols in the specified method and corresponding SOPs regarding the frequency of laboratory duplicates. This allows intra-laboratory precision information to be obtained on sample acquisition, handling, shipping, storage, preparation, and analysis. Both samples can be carried through the steps in the

measurement process together to provide an estimate of short-term precision. An estimate of long-term precision can be obtained by separating the two samples and processing them at different times, or by different people, and/or analyzed using different instruments. Acceptable RPDs will be in accordance to those specified by each analysis method.

For duplicate measurements, relative percent difference (RPD) is calculated as follows:

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100\%$$

RPD = relative percent difference

D₁ = sample value

D₂ = duplicate sample value

For three or more replicates:

$$RSD = (s/x) \times 100$$

RSD = relative standard deviation

s = standard deviation of three or more results

x = mean of three or more results

Standard deviation is defined as follows:

$$s = ((\sum(y_i - \text{mean } y)^2 \times 1/(n-1)))^{0.5}$$

s = standard deviation

y_i = measured value of the replicate

mean y = mean of replicate measurements

n = number of replicates

Quality control limits for Precision, Accuracy, and Completeness are summarized in Tables 2 through Table 7.

5.2.4 Accuracy

Accuracy measures how close analytical results are to a true or expected value. Accuracy objectives will be determined by calculating the percent recovery range of laboratory matrix spikes and matrix spike duplicates. Accuracy measures are calculated using the RPD between the expected value and the actual analytical results.

5.2.5 Representativeness

Representativeness is the degree to which the sampling data properly characterize the study environment. For the field-sampling phase, the previously established sampling sites reasonably cover the entire project area, and have been previously deemed to adequately represent any various sub-units within the project area.

In the analytical phase, and as specified elsewhere in this document, appropriate sample storage and preservation, and sample homogenization will insure that the samples analyzed adequately reflect conditions as they existed in the natural environment.

5.2.6 Comparability

Comparability states the confidence with which one data set can be compared to another. Comparability will be enhanced by the consistent use of standardized sampling methods and

specified protocols for the sampling phase and through the use of standard documented methodologies for analyte determinations. Any deviations from the standardized, selected methods or protocols will be clearly documented by the laboratories and noted in the final analytical report. There are a number of issues that can make two data sets comparable, and the presence of each of the following items enhances their comparability:

- Two data sets should contain the same set of variables of interest
- Units in which these variables were measured should be convertible to a common metric
- Similar analytical procedures and quality assurance should be used to collect data for both data sets
- Time measurements of certain characteristics (variables) should be similar for both data sets
- Measuring devices used for both data sets should have approximately similar detection levels
- Rules for excluding certain types of observations from both samples should be similar
- Samples within data sets should be selected in a similar manner
- Sampling frames from which the samples were selected should be similar
- Number of observations in both data sets should be of the same order or magnitude.

These characteristics vary in importance depending on the final use of the data. The closer two data sets are with regard to these characteristics, the more appropriate it will be to compare them. Large differences between characteristics may be of only minor importance, depending on the decision that is to be made from the data.

For this investigation, comparability will be satisfied by ensuring that the field sampling plan is followed, standard EPA Methods of analysis are used for sample analysis and that proper sampling techniques are used.

5.2.7 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Field completeness objectives for this project will be greater than 90%. Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Laboratory completeness for this project will be greater than 90% of the total number of samples submitted to the analytical laboratories.

The calculation for percent completeness is as follows:

$$\%C = 100\% \times (V/n)$$

%C = percent completeness

V = number of valid measurements

n = number of measurements planned

6. Documentation and Records

6.1 Field Documentation

Field logs, boring logs, ship logs, and chain of custody documents will be used to record appropriate sample collection information in the field.

Sediment Sample Collection/Boring Logs: A sediment sample collection and/or boring log will be filled out by the field crew for each sample collected. All original field data sheets shall be turned over to the Project Coordinator at the conclusion of the field sampling and shall be kept as part of the permanent project file. A summary of sample collection information shall be maintained for each day of field sampling. Information to be included in the field log shall include but not be limited to: sample location ID, latitude/longitude of each sampling location, time of sample collection, water depth, etc.

Chain-of-Custody Forms:

An example chain of custody form is provided in Appendix A. A chain-of-custody form will be filled out for each set of samples shipped to the laboratory. A copy of the chain-of-custody form will be faxed to the Altech Environmental Services' Project Manager at the end of the field sample portion of this project.

6.2 Laboratory Reports

All laboratory data and records will be included in the final analytical report submitted to the project manager. A complete copy of the QAPP will be provided to the lab. The project manager will be responsible for maintaining the reports in the permanent project file. The following laboratory-specific records will be compiled by the laboratory and included in the final analytical report submitted to the project manager.

Sample Data. These records contain the times that samples were analyzed to verify that they met holding times prescribed in the analytical methods. Included should be the overall number of samples, sample location information, any deviations from the SOPs, time of day, and date. Corrective action procedures to replace samples violating the protocol also should be noted.

Sample Management Records. Sample management records document sample receipt, handling and storage, and scheduling of analyses. The records verify that sample tracking and proper preservation were maintained, reflect any anomalies in the samples (such as receipt of damaged samples), note proper log-in of samples into the laboratory, and address procedures used to ensure that holding time requirements were met.

Test Methods. Unless analyses are performed exactly as prescribed by SOPs, this documentation will describe how the analyses were carried out in the laboratory. This includes sample preparation and analysis, instrument standardization, detection and reporting limits, and test-specific QC criteria. Documentation demonstrating laboratory proficiency with each method used should be included (i.e. LCS data).

QA/QC Reports. These reports will include the general QC records, such as instrument calibration, routine monitoring of analytical performance, calibration verification, etc. Project-specific information from the QA/QC checks such as blanks (e.g., reagent, method), spikes (e.g.,

matrix, matrix spike duplicate, surrogate spike), calibration check samples (e.g., zero check, span check, and mid-range check), replicates, and so on should be included in these reports to facilitate data quality analysis.

Data Reporting Package Format and Documentation Control Report: The format of all data reporting packages must be consistent with the requirements and procedures used for data validation and data assessment described in Sections 8, 9, and 10 of the QAPP. The Field Sampling Coordinator will ensure that data are being recorded appropriately on the sample labels, sample tracking forms, and in the field notebook. All entries will be made using permanent ink, signed, and dated, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. A similar data entry process will be followed by the contract laboratory. Only QC/Calibration summary forms will be provided at this time, unless analytical raw data is necessary.

Contract laboratory will be expected to provide a data package with the following components:

- Case Narrative:
- Date of issuance
- Laboratory analyses performed
- Any deviations from intended analytical strategy
- Laboratory batch number
- Numbers of samples and respective matrices
- Quality control procedures utilized and also references to the acceptance criteria
- Laboratory report contents
- Project name and number
- Condition of samples “as received”
- Discussion of whether or not sample holding times were met
- Discussion of technical problems or other observations which may have created analytical difficulties
- Discussion of any laboratory QC checks which failed to meet project criteria
- Signature of the Laboratory QA Manager.

Chemistry Data Report:

- Case narrative for each analyzed batch of samples
- Summary page indicating dates of analyses for samples and laboratory quality control checks
- Cross referencing of laboratory sample to project sample identification numbers
- Descriptions of data qualifiers
- Sample preparation and analyses for samples
- Sample and laboratory quality control results
- Results of (dated) initial and continuing calibration checks
- Matrix spike and matrix spike duplicate recoveries, laboratory control samples, method blank results, calibration check compounds, and system performance check compound results
- Results of tentatively identified compounds.

**** An electronic copy of the Analytical Data Report will be submitted in an MS Excel format on CD containing the analytical test results ****

7. Special Training Requirements

No special training requirements are required for this project.

8. Quality Control Requirements

All analytical procedures are documented in writing as SOPs and each SOP includes QC information, which addresses the minimum QC requirements for the procedure. The internal quality control checks might differ slightly for each individual procedure. Examples of some of the QC samples that will be used during this project include:

- Method blanks
- Reagent/preparation blanks
- Instrument blanks
- Surrogate spikes
- Analytical spikes
- Field replicates
- Laboratory duplicates
- Matrix Spike/Matrix Spike Duplicate
- Laboratory control standards
- Internal standard areas for GC/MS or GC/ECD analysis; control limits.

The actual QC samples requirements will be dictated by the method requirements. Details on the use of each QC check are provided in the analytical SOPs provided for each measurement. Method detection limits will be calculated for each analyte.

Note: Instrument calibration concentrations, method validation procedures, internal quality control protocols, analytical routines, maintenance and corrective actions, and the data reduction procedures are included in and will be performed as specified in the Standard Operation Procedures as required by the designated analytical methods.

8.1 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The purpose of this section is to discuss the procedures used to verify that all instruments and equipment are maintained in sound operating condition, and are capable of operating at acceptable performance levels.

Testing, Inspection, and Maintenance

The success of this project is dependent on well functioning field, analytical, and toxicological equipment. Preventative maintenance of this equipment is the key to reduce possible project delays due to faulty equipment.

As part of each laboratory's QA/QC program, a routine preventative maintenance program will be conducted to minimize the occurrence of instrument failure and other system malfunctions. All laboratory instruments are maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance is carried out on a regular, scheduled basis and is documented in the laboratory instrument service logbook for each instrument.

8.2 Instrument Calibration and Frequency

This section concerns the calibration procedures that will be used for instrumental analytical methods and other measurement methods that are used in environmental measurements. Calibration is defined as checking physical measurements against accepted standards.

Instrumentation Requiring Calibration

All of the equipment used to analyze the sediment samples will require calibration.

Calibration Methods That Will Be Used For Each Instrument

Instrument calibration procedures are dependent on the method and corresponding SOP. All ongoing calibration measurements must be within the requirements of the corresponding SOP to be considered adequate

Calibration Apparatus

None of the analytical instruments will be calibrated using a calibration apparatus.

Calibration Standards

The working linear range of an instrument should be established prior to performing sample analyses. Calibration standards as specified in the applicable methods and SOPs will be used when establishing the working linear range. The working linear range for a specific analysis should bracket the expected concentrations of the target analyte in the samples to be analyzed.

Calibration Frequency

Instrument calibration is performed before sample analysis begins and is continued during sample analysis at the intervals specified within the applicable methods and SOPs in order to ensure that the data quality objectives are met. The verification of instrument stability is assessed by analyzing continuing calibration standards at regular intervals during the period that sample analyses are performed. Standards will be analyzed on a schedule as specified in the analytical SOPs. The concentration of the continuing calibration standard should be equivalent to the midpoint of the working linear range of the instrument.

Equipment logbooks will be maintained at the laboratory, in which will be recorded the usage, maintenance, calibration, and repair of instrumentation. These logbooks will be available during any audits that may be conducted.

8.3 Inspection/Acceptance Requirements for Supplies and Consumables

The purpose of this section is to establish and document a system for inspecting and accepting all supplies and consumables that may directly or indirectly affect the quality of the project or task.

Identification of Critical Supplies and Consumables

Critical supplies and consumables include sample bottles, gases, reagents, hoses, materials for decontamination activities, and distilled/deionized water. The laboratory will utilize high quality supplies and consumables to reduce the chances of contaminating the samples. All water purification systems are tested on a regular basis to ensure that water produced is acceptable for use. Solvent blanks are run to verify the purity of solvents used in the organic analyses. The contract laboratory may also incorporate other measures, such as the dedicated use of glassware for certain analyses.

Establishing Acceptance Criteria

Acceptance criteria must be consistent with overall project technical and quality criteria. The laboratory should utilize their own acceptance criteria for normal operations with analyzing and/or testing contaminated sediments.

Inspection of Acceptance Testing Requirements and Procedures

The contract laboratory should document inspections of acceptance testing, including procedures to be followed, individuals responsible, and frequency of evaluation. In addition, handling and storage conditions for supplies and consumables should be documented.

Tracking and Quality Verification of Supplies and Consumables

Procedures should be established to ensure that inspections or acceptance testing of supplies and consumables are adequately documented by permanent, dated, and signed records or logs that uniquely identify the critical supplies or consumables, the date received, the date tested, the date to be retested (if applicable), and the expiration date. These records should be kept by the responsible individual(s) at the laboratory. In order to track supplies and consumables, labels with the information on receipt and testing should be used. These or similar procedures should be established to enable project personnel to: 1) verify, prior to use, that critical supplies and consumables meet the project objectives; and 2) ensure that supplies and consumables that have not been tested, have expired, or do not meet acceptance criteria are not used for the project.

8.4 Data Management

This section will present an overview of all mathematical operations and analyses performed on raw data to change their form of expression, location, quantity, or dimensionality. These operations include data recording, validation, transformation, transmittal, reduction, analysis, management, storage, and retrieval.

Laboratory Data Recording

All raw analytical and toxicity data will be recorded in numerically identified laboratory notebooks or data sheets. The data will be promptly recorded in black ink on appropriate forms that are initialed and dated by the person collecting the data. Changes to recorded data are made in black ink, with a single line cross-out, initials, and date. No “whiteout” will be allowed.

If a laboratory has the capability to directly enter or download the data into a computerized data logger, then this is preferable. All labs shall download data directly into a computerized database. Sample data are recorded along with other pertinent information, such as the sample identification number. Other details which will also be recorded include: the analytical method used (SOP #), name of analyst, the date of analysis or toxicity test, matrix sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook or data sheet will be signed and dated by the analyst. Copies of any strip chart printouts (such as gas chromatograms) will be maintained on file. Periodic review of these notebooks by the Laboratory Supervisors will take place prior to final data reporting. Records of notebook entry inspections are maintained by the Laboratory QA/QC Officer.

Data Verification

The method, instrument, or system should generate data in a consistent, reliable, and accurate manner. Data validation will be shown by meeting acceptable QC limits for analytical parameters and sediment toxicity tests. In addition, the application of preventative maintenance activities and internal QA/QC auditing will ensure that field and laboratory generated data will be valid. Quality control data (e.g., laboratory duplicates, matrix spikes, matrix spike duplicates, and performance of negative controls) will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data verification is performed by a second designated senior/experienced staff at the technical level where QC results, hold times, and instrument calibration is evaluated. All QA requirements are programmed into automated systems and flagged where appropriate.

Data Transformation

Data transformations result from calculations based on instrument output, readings, or responses. The procedures for converting calibration readings into an equation that will be applied to measurement readings are given in the SOPs for analytical parameters.

Data Transmittal

Data transmittal occurs when data are transferred from one person or location to another or when data are copied from one form to another. Some examples of data transmittal are copying raw data from a notebook onto a data entry form for keying into a computer file and electronic transfer of data over a computer network. The transmittal of field data will be double-checked by the PI. The transmittal of laboratory data will be checked by the individual analyst with periodic checks by the Laboratory Project Manager and/or QA/QC Officer.

Data Reduction

Data reduction includes all processes that change the number of data items. The laboratory has their own data reduction techniques, as is usually documented in their QA Manual. For the analytical results, data reduction will involve calculating the arithmetic mean and standard deviation of field and laboratory replicates.

Data Analysis

Data analysis will involve comparing the surficial contaminant concentrations to qualitative values contained in Tables 2 through 7. The analysis shall be performed by the WDNR Project Manager.

Data Tracking

Data management includes tracking the status of data as they are collected, transmitted, and processed. The laboratory will have its own data tracking system in place.

Data Storage and Retrieval

The contract laboratory will have its own data storage and retrieval protocols. USEPA-GLNPO will retain all the analytical data packages in the project files for this study. In addition, the sediment contaminant data will be added to GLNPO's contaminated sediment database.

8.5 Data Acquisition Requirements (Non-Direct)

Additionally, sets of screening values will be used to evaluate the potential impacts of the contaminant concentrations found in the sediments during this survey. All parameter data will be compared to existing sediment quality guidelines available in *MacDonald et. Al.* (2000) and *Persuad et. Al* (1993). All of these screening levels were specifically developed for freshwater ecosystems and have been published in peer reviewed journals and documents. Therefore, these guidelines are considered sufficient for a screening level analysis of sediment data.

Water surface elevation data will be obtained from the NOAA web page. Only data from the "verified/historical water level data" page will be utilized in the study. However, NOAA has attached the following disclaimer on data from this web page:

"These raw data have not been subjected to the National Ocean Service's quality control or quality assurance procedures and do not meet the criteria and standards of official National Ocean Service data. They are released for limited public use as preliminary data to be used only with appropriate caution."

Since the water surface elevation data is non-critical data, this preliminary data is sufficient for our needs.

9. Assessment and Oversight

9.1 Assessment and Response Actions

During the planning process, many options for sampling design, sample handling, sample cleanup and analysis, and data reduction are evaluated and chosen for the project. In order to ensure that the data collection is conducted as planned, a process of evaluation and validation is necessary. This section of the QAPP describes the internal and external checks necessary to ensure that:

- All elements of the QAPP are correctly implemented as prescribed.
- The quality of the data generated by implementation of the QAPP is adequate.
- Corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed.

The most important part of this section is documenting all planned internal assessments. Generally, internal assessments are initiated or performed by the QA Officer.

Assessment of Subsidiary Organizations

Two types of assessments of the subsidiary organizations can be performed as described below.

- *Management Systems Review (MSR).* A form of management assessment, this process is a qualitative assessment of a data collection operation or organization to establish whether the prevailing quality management structure, policies, practices, and procedures are adequate for ensuring that the type and quality of data needed are obtained. The MSR is used to ensure that sufficient management controls are in place and carried out by the organization to adequately plan, implement, and assess the results of the project.
- *Readiness Reviews.* A readiness review is a technical check to determine if all components of the project are in place so that work can commence on a specific phase.

It is anticipated that a readiness review by each contract laboratory project manager will be sufficient for this project. No management systems review is anticipated for this project. A pre-project QA/QC conference call (already held) and submittal of laboratory certifications and/or QA plans shall suffice as a MSR.

Assessment of Project Activities

Assessment of project activities can involve the following tasks:

- Surveillance
- Technical Systems Audit (TSA)
- Performance Evaluation (PE)
- Audit of Data Quality (ADQ)
- Peer Review
- Data Quality Assessment.

Surveillance will be the primary assessment technique of project activities. This will most readily occur by the Project Manager and QA Officer of the contract laboratory.

Number, Frequency, and Types of Assessments

Due to the short-term nature of this project for the contract laboratory, no types of assessments are planned other than general surveillance, a data quality assessment by USACE representatives, and peer review by USACE and USEPA.

Assessment Personnel

Internal audits of the contract laboratory are regularly performed by their respective QA Officers.

Schedule of Assessment Activities

External audits by the GLNPO QA Officer and/or the GLNPO Project Manager is up to his/her discretion. The scheduling of regular internal audits at contract labs is at the discretion of the respective QA/QC Officer.

Reporting and Resolution of Issues

Any audits or other assessments that reveal findings of practice or procedure that do not conform to the written QAPP need to be corrected as soon as possible. The Laboratory Project Manager and Laboratory QA/QC Officer need to be informed immediately of critical deviations that compromise the acceptability of the test. For any critical deviations from the QAPP (i.e.,

elevated detection levels, surrogate recoveries outside control limits, etc.) that cannot be corrected within the laboratory's standard procedure, the Laboratory Project Manager must contact both the USEPA Project Manager and the USACE Project Coordinator within 24-hours of being informed of the deviation. The laboratory project manager should be ready to provide suggestions for corrective action. For non-critical deviations, they need to be informed by the next business day.

Corrective actions should only be implemented after approval by both the USACE Project Coordinator and the USEPA Project Manager. If immediate corrective action is required, approvals secured by telephone from the USEPA Project Manager should be documented in an additional memorandum. In general communications from the laboratory should follow the chain-of-command as shown in Figure 1. However, if the contract laboratory is unable to contact the Altech Environmental Services Project Manager on any time-critical matter, the laboratory shall contact either the USACE Project Coordinator or USEPA Project Manager as necessary.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem will be responsible for notifying the project manager. Implementation of corrective actions will be confirmed in writing through the same channels. The laboratory shall issue a nonconformance report for each nonconformance condition.

Corrective actions in the laboratory may occur prior to, during, and after initial analysis. A number of conditions, such as broken sample containers, multiple phases, and potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts and section leaders, it may be necessary for the Laboratory QA/QC Officer to approve the implementation of corrective actions. The submitted SOPs specify some conditions during or after analysis that may automatically trigger corrective actions of samples, including additional sample extract cleanup and automatic re-injection/reanalysis when certain quality control criteria are not met.

Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken is somewhat dependent on the analysis and the event.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or RPD between duplicates
- There are unusual changes in detection limits
- QC limits for sediment toxicity tests are not met
- Deficiencies are detected by the Laboratory and/or GLNPO QA Officer(s) during any internal or external audits or from the results of performance evaluation samples
- Inquiries concerning data quality are received.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, experimental set-up, and so on. If the problem persists or cannot be identified, the matter is referred to the Laboratory Project Manager and/or

Laboratory QA/QC Officer for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the Laboratory QA/QC Officer.

These corrective actions are performed prior to release of the data from the laboratory. The corrective actions will be documented in both the laboratory's corrective action log and the narrative data report sent from the laboratory to the Altech Environmental Services Project Manager.

If corrective action does not rectify the situation, the laboratory will contact Altech Environmental Services Project Manager who will then contact the USACE Project Coordinator and USEPA Project Manager to discuss details of the corrective actions and required future actions.

9.2 Reports to Management

Responsible Organizations

Written QC data and appropriate QA/QC reports generated by the laboratory shall be included in the Analytical Data Report. The Analytical Data Report will be provided by the laboratory to the Project Manager by the persons identified in Section 1.3 whenever sample measurements are reported. The QC section of the Analytical Data Report should include the QC data (including results, recoveries, and RPDs), any non-conformance reports, and chains of custody. The report should give detailed results of analysis of QC samples, and provide information on the precision, accuracy, and completeness for each sample run. These written reports will note any significant QA/QC problems encountered during sample analyses, as well as state the corrective actions taken.

Any serious QA problems needing immediate decisions will be discussed orally between the USACE Project Coordinator and laboratory staff, with such discussions denoted in writing. Communication should follow the chain-of-command summarized in Figure 1. These problems will be noted in the final project report to the USEPA Project Manager.

The USACE Project Coordinator will provide summary QA/QC information in the final written report to USEPA. This report will include information on adherence of measurements to the QA objectives. The final report will contain detailed discussions of QA/QC issues, including any changes in the QAPP, a summary of the contract laboratory QA/QC reports, results of any internal performance audits, any significant QA/QC problems, detailed information on how well the QA objectives were met, and their ultimate impact on decision making. The following is a list of items to be included in the final project report:

- Changes in the QAPP
- Results of any internal system audits
- Significant QA/QC problems, recommended solutions, and results of corrective actions
- Data quality assessment in terms of precision, accuracy, representativeness, completeness, and sensitivity
- Indication of fulfillment of QA objectives
- Limitations on the use of the measurement data.

10. Data Validation and Usability

The USEPA Project Manager will make a final decision regarding the validity and usability of the data collected during this project. The project manager will evaluate the entire sample collection, analysis, and data reporting processes to determine if the data is of sufficient quality to meet project objectives. Data validation involves all procedures used to accept or reject data after collection and prior to use. These include screening, editing, verifying, and reviewing through external performance evaluation audits. Data validation procedures ensure that objectives for data precision and bias will be met, that data will be generated in accordance with the QA project plan and SOPs, and that data are traceable and defensible. The process is both qualitative and quantitative and is used to evaluate the project as a whole.

Procedures Used to Validate Field Data

Procedures to evaluate field data for this project primarily include checking for transcription errors and reviewing field notebooks. This task will be the responsibility of the WDNR project manager.

Procedures Used to Validate Laboratory Data

The Laboratory QA/QC Officer will conduct a systematic review of the analytical data for compliance with the established QC criteria based on the spike, duplicate, and blank results provided by the laboratory. All technical holding times will be reviewed, the laboratory analytical instrument performance will be evaluated, and results of initial and continuing calibration will be reviewed and evaluated.

Upon receipt of the draft laboratory report, the U.S. Army Corps of Engineers will perform a QA/QC review of the analytical report. At a minimum, this review will include an analysis of:

- Sample Receipt Verification/Documentation
- Detection Limits
- Surrogate Recoveries
- Laboratory QC Documentation and Results
- Holding Time Data
- Process Bias and Sensitivity
- MS/MSD Recoveries
- Analytical Method Documentation

At the conclusion of the review, the U.S. Army Corps of Engineers will prepare a report describing the results of the review, providing recommendations on data items requiring corrective action or further documentation/information, and drawing conclusions as to the usability of the data provided. A draft report will be provided to the analyzing laboratory and the U.S. EPA project manager for review and comment prior to finalizing conclusions and recommendations.

The data review will identify any out-of-control data points and data omissions, and the Laboratory QA Officer will interact with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analysis may be made by the USEPA Project Manager based on the extent of the deficiencies and their importance in the overall context of the project.

Additionally, the USEPA project manager will compare all field and laboratory duplicates for RPD. Based on the results of these comparisons, the USEPA project manager will determine the acceptability of the data. One hundred percent of the analytical data will be validated. Reconciliation of laboratory and field duplicates shall be the responsibility of the USEPA project manager.

Finally, the USACE project coordinator will compare the laboratory methods and results to the QA/QC Review checklist contained in Appendix B. Any critical problems identified by these checklist that we are unable to rectify through corrective actions, may be cause for rejecting portions or all of the data provided.



**U.S. Army Corps of Engineers, Detroit District
Environmental Analysis Branch**

Address:						Project Name:							Requested Analysis								Lab Comments:	
						Project #																
To:						P.O.#																
Phone:						Sampled by:																
Fax:						Name: Initials:																
Turnaround time:				Samples Received: Cold: Y N ____ °C Intact: Y N																		
#	Sample Identification					Date	Time	Comp	Grab	Matrix	#											
Relinquished By:						Received By:				Date/Time:			Notes:									
Relinquished By:						Received By:				Date/Time:												

APPENDIX B

Minimum QA/QC Checklist for Data Evaluation

Upon receipt of the Draft Analytical Report, the draft report will be checked to verify that the following are included:

1. Project name and number
2. Date of issuance
3. Laboratory report contents
4. Case Narrative
5. Numbers of samples analyzed
6. Laboratory analysis performed
7. Condition of the samples "as received"
8. Copy of the cooler receipt form
9. Any deviations from the intended analytical strategy
10. Discussion of whether or not sample hold times were met
11. Discussion of technical problems or other observations which may have created analytical difficulties
12. Discussion of any laboratory QC checks which failed to meet project criteria
13. Analytical test results in spreadsheet format using USACE sample I.D.s and laboratory sample I.D.s
14. Summary page indicating dates of analyses for samples and laboratory quality control checks
15. Analytical test methods utilized
16. Quality control test results
17. Descriptions of data qualifiers
18. Matrix spike/matrix spike duplicate recoveries, laboratory control samples, method blank results calibration check compounds, system performance check compound results, and precision results
19. Statement signed by laboratory QA/QC officer that all data and information submitted is valid.

APPENDIX C**COOLER RECEIPT FORM**

LIMS # _____

Number of Coolers _____

PROJECT: _____ Date/Time Received _____

A. PRELIMINARY EXAMINATION PHASE:

Cooler opened by (print) _____ (sign) _____

1. Did cooler come with a shipping label (air bill, etc)?.....YES NO
 If yes, enter carrier name & air bill number _____

2. Were custody seals outside of cooler?.....YES NO
 How many & where _____, sealed date: _____ seal name: _____

3. Were seals unbroken and intact at the date and time of arrival?.....YES NO

4. Were Chain-of-Custody papers in a plastic bag & taped to the cooler lid?.....YES NO

5. Were Chain-of-Custody papers filled out properly?.....YES NO

6. Did you sign the Chain-of-Custody papers in the appropriate location?.....YES NO

7. Were temperature blanks used?.....YES NO
 Cooler Temperature _____ (°C) Thermometer ID No. _____

8. Have designated person initial here to acknowledge receipt of
 cooler: _____ Date/time _____

Comments:

Continued

COOLER RECEIPT FORM Continued

B. LOG-IN PHASE: Date samples were logged in: _____

By (print) _____ (sign) _____

11. Describe type of packing in cooler: _____

12. Were all bottles sealed in separate plastic bags?.....YES NO

13. Did all bottles arrive unbroken with labels in good condition?.....YES NO

14. Were all bottle labels complete (ID, date, time, initials, etc.?)......YES NO

15. Did all labels agree with Chain-of-Custody?.....YES NO

16. Was a sufficient amount of sample sent for tests indicated?.....YES NO

17. If answered NO to any of the above, was laboratory manager notified and project manager called to discuss?.....YES NO

Document discussion/comments:

APPENDIX D

SHIPPING CONTAINER CHECKLIST SUMMARY

Failure to properly handle or document the Project samples could jeopardize the usability of the sample results and ultimately the Project. Prior to sending a cooler to the Analytical Laboratory please check the following items:

- * Is the Project clearly identified on the Chain-of-Custody (official project name, project location)?
- * Are all enclosed sample containers clearly labeled with waterproof ink, is the label covered with clear tape, enclosed in a plastic bag, and wrapped in bubble wrap?
- * Are the sample labels complete?
- * Are the desired analyses indicated on the bottle labels and Chain-of-Custody?
- * Does the information on the Chain-of-Custody match the information on the sample container labels?
- * Is the sample identification clearly marked on the sample container enclosure with waterproof ink?
- * Has the Chain-of-Custody been placed into a plastic bag and attached to the inside of the cooler lid?
- * Is the shipping Bill of Lading been properly and clearly filled out including laboratory contact name and phone number?
- * Is there sufficient ice (double bagged in ziploc baggies) or "blue ice" in the cooler?
- * Are the sample container secured (no free space between containers) with bubble wrap or equivalent?

APPENDIX E

Sampling Station Coordinates

Station Identification	Degrees Minutes Seconds	Degrees Minutes	State Plane NAD 83
KK0201	N 43 ⁰ 00' 24.582"	N 43 ⁰ 00.4097'	N 373938.5418
	W 87 ⁰ 54' 49.461"	W 87 ⁰ 54.8244'	E 2526476.8398
KK0202	N 43 ⁰ 00' 26.052"	N 43 ⁰ 00.4342'	N 374084.8365
	W 87 ⁰ 54' 50.774"	W 87 ⁰ 54.8462'	E 2526375.5895
KK0203	N 43 ⁰ 00' 27.127"	N 43 ⁰ 00.4521'	N 374193.0581
	W 87 ⁰ 54' 51.121"	W 87 ⁰ 54.8520'	E 2526374.0692
KK0204	N 43 ⁰ 00' 27.587"	N 43 ⁰ 00.4598'	N 374242.5581
	W 87 ⁰ 54' 49.501"	W 87 ⁰ 54.8250'	E 2526466.2548
KK0205	N 43 ⁰ 00' 29.083"	N 43 ⁰ 00.4847'	N 377391.5662
	W 87 ⁰ 54' 50.804"	W 87 ⁰ 54.8467'	E 2526365.6385
KK0206	N 43 ⁰ 00' 28.793"	N 43 ⁰ 00.4799'	N 374368.3612
	W 87 ⁰ 54' 47.492"	W 87 ⁰ 54.7915'	E 2526612.4021
KK0207	N 43 ⁰ 00' 30.135"	N 43 ⁰ 00.5022'	N 374505.5048
	W 87 ⁰ 54' 46.746"	W 87 ⁰ 54.7791'	E 2526664.4580
KK0208	N 43 ⁰ 00' 29.027"	N 43 ⁰ 00.4838'	N 374397.3218
	W 87 ⁰ 54' 44.620"	W 87 ⁰ 54.7437'	E 2526825.1040
KK0209	N 43 ⁰ 00' 29.594"	N 43 ⁰ 00.4932'	N 374455.7424
	W 87 ⁰ 54' 44.067"	W 87 ⁰ 54.7344'	E 2526864.7492
KK0210	N 43 ⁰ 00' 30.668"	N 43 ⁰ 00.5111'	N 374570.0809
	W 87 ⁰ 54' 41.053"	W 87 ⁰ 54.6842'	E 2527085.9289
KK0211	N 43 ⁰ 00' 30.479"	N 43 ⁰ 00.5080'	N 374554.1841
	W 87 ⁰ 54' 39.337"	W 87 ⁰ 54.6556'	E 2527213.8477
KK0212	N 43 ⁰ 00' 29.352"	N 43 ⁰ 00.4892'	N 374444.6494
	W 87 ⁰ 54' 36.910"	W 87 ⁰ 54.6152'	E 2527396.9646
KK0213	N 43 ⁰ 00' 29.196"	N 43 ⁰ 00.4866'	N 374432.3383
	W 87 ⁰ 54' 35.002"	W 87 ⁰ 54.5834'	E 2527539.0922
KK0214	N 43 ⁰ 00' 30.198"	N 43 ⁰ 00.5033'	N 374540.8733
	W 87 ⁰ 54' 31.186"	W 87 ⁰ 54.5198'	E 2527819.9944